National Institute of Environmental Health Sciences

Global climate change and its impacts on water resources planning and management: Assessment and challenges

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Abstract:

Population exPLoSion and its many associated effects (e.g. urbanization, water pollution, deforestation) have already caused enormous stress on the world's fresh water resources and, in turn, environment, health, and economy. According to latest World Health Organization estimates, about 900 million people still lack access to safe drinking water, about 2.5 billion people lack access to proper sanitation, millions of people die every year from water-related disasters and diseases, and economic losses in the order of billions of dollars occur due to water-related disasters. With the global climate change anticipated to have threatening consequences on our water resources and environment both at the global level and at local/regional levels (e.g. increases in the number and magnitude of floods and droughts, increases in sea levels), a general assessment is that the future state of our water resources will be a lot worse than it is now. The facts that over 300 rivers around the world are being shared by two or more nation states and that there are already numerous conflicts in the planning, development, and management of water resources in these basins further complicate matters for future water resources planning. In view of these, any sincere effort towards proper management of our future water resources and resolving potential future water-related conflicts will need to overcome many challenges. These challenges are both biophysical science-related and human science-related. The biophysical science challenges include: identification of the actual causes of climate change, development of global climate models (GCMs) that can adequately incorporate these causes to generate dependable future climate projections at larger scales, formulation of appropriate techniques to downscale the GCM outputs to local conditions for hydrologic predictions, and reliable estimation of the associated uncertainties in all these. The human science challenges have social, political, economic, and environmental facets that often act in an interconnected manner; proper 'communication' of (or lack thereof) our climate-water 'scientific' research activities to fellow scientists and engineers, policy makers, economists, industrialists, farmers, and the public at large crucially contributes to these challenges. The present study is intended to review the current state of our water resources and the climate change problem and to detail the challenges in dealing with the potential impacts of climate change on our water resources.

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Resource Description

Climate Scenario :

specification of climate scenario (set of assumptions about future states related to climate)

Special Report on Emissions Scenarios (SRES), Other Climate Scenario

Special Report on Emissions Scenarios (SRES) Scenario: SRES A1, SRES B1

Other Climate Scenario: A1F1;A1B

Communication: ☑

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

Communication Audience: ☑

audience to whom the resource is directed

Policymaker

Other Communication Audience: Water resource managers

Exposure : ☑

weather or climate related pathway by which climate change affects health

Extreme Weather Event, Food/Water Quality, Food/Water Security, Sea Level Rise, Temperature

Extreme Weather Event: Drought, Flooding, Hurricanes/Cyclones

Geographic Feature: ☑

resource focuses on specific type of geography

Freshwater

Geographic Location: ☑

resource focuses on specific location

Global or Unspecified

Health Co-Benefit/Co–Harm (Adaption/Mitigation): ☑

specification of beneficial or harmful impacts to health resulting from efforts to reduce or cope with greenhouse gases

A focus of content

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Adaptation

Model/Methodology: ☑

type of model used or methodology development is a focus of resource

Exposure Change Prediction

Population of Concern: A focus of content

Population of Concern: ☑

populations at particular risk or vulnerability to climate change impacts

Children, Low Socioeconomic Status

Resource Type: ☑

format or standard characteristic of resource

Review

Timescale: ☑

time period studied

Long-Term (>50 years)

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content